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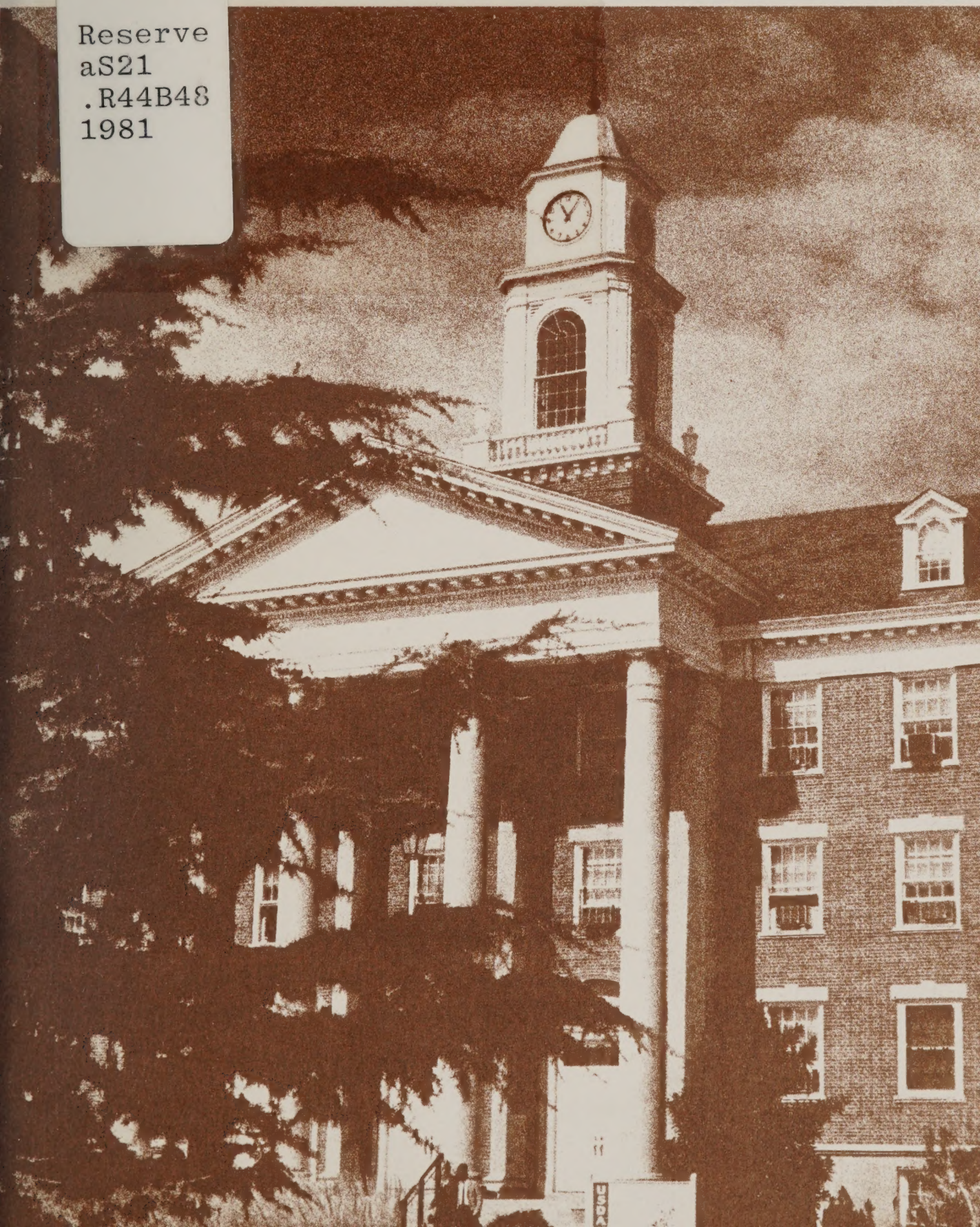
United States Department of Agriculture

Science and Education Administration

Northeastern Region

The Beltsville Agricultural Research Center



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Visitors to BARC may arrange for a guided tour or tour the Center in their own car on the self-guided tour. Maps for the self-guided tour are available at the Visitors Center (Building 186) during the regular working hours of 8:00 a.m. to 4:30 p.m. Monday through Friday. To arrange for your guided tour call (301) 344-2483 or write:

Tour Coordinator
Agricultural Research Center
Beltsville, Md. 20705

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United States Department of Agriculture
Science and Education Administration

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The Beltsville Agricultural Research Center

The Beltsville Agricultural Research Center (BARC) is one of the largest and most diversified agricultural research complexes in the world—covering more than 7,000 acres at Beltsville, Md.

The Center began in 1910 when the U.S. Department of Agriculture purchased a 475-acre farm about 15 miles northeast of Washington, D.C., to conduct research on animal husbandry, dairying, and animal diseases. During the following years more acres were added to the farm and more research projects to its program. By 1942 the Bureau of Plant Industry was located at Beltsville. Today some 2,550 USDA employees plus 200 employees from other Federal agencies work at the Center in more than 1,000 buildings—research laboratories, greenhouses, barns, poultry houses, shops, and offices.

About 900 are scientists and technicians knowledgeable in a wide range of subjects. Animal researchers study livestock diseases, animal nutritional needs, and animal genetics and physiology in order to improve the productivity of cattle, poultry, swine, and sheep. Plant specialists are seeking greater crop yields by breeding plants which use light and nutrients more efficiently, which have built-in disease resistance, or which are able to cope with marginal growing conditions. Others develop new methods to fight plant pests and diseases using nature's own resources—biological controls and naturally occurring chemicals—which are integrated with better cultural methods to safeguard the environment while reducing crop loss. Still others work to insure that meat, milk, and produce reach the consumer with all their natural taste and nutritional value.

Beltsville's record of accomplishments (see pages 6 and 7) has made it a leader in agricultural research. Its international repute each year brings thousands of visitors from the United States and abroad to tour the Center. It is the home of several world

renowned research collections: the National Parasite Collection, the Small-Grain Collection, and outstanding collections of fungi, nematodes, seeds, and nitrogen-fixing bacteria.

The organizational structure at BARC has changed periodically over the years to keep research in step with present day needs. In 1978 the Agricultural Research Service (ARS) got a new name—Science and Education Administration-Agricultural Research (SEA-AR). Research at Beltsville was realigned under eight institutes comprising 51 laboratories and units. Human nutrition studies are now under the aegis of SEA's Human Nutrition while several laboratories involved in marketing research are now affiliated with USDA's Agricultural Marketing Service.

This publication briefly describes the research programs of the eight institutes in Agricultural Research. Names and locations of the institute chairmen and laboratory chiefs are listed with the research program descriptions. Studies on human nutrition carried out in the Beltsville Human Nutrition Research Center are also described.

Some Major Accomplishments of BARC Scientists

Historical

- Developed genetics concepts which laid the foundation for modern plant and animal breeding and proved the value of statistical methods in evaluating inherited characteristics in populations.

- Pioneered research on photoperiodism (plant response to variations in the light/dark cycle) which culminated in the chemical isolation of phytochrome, the triggering mechanism of plant growth.

- Developed and introduced many pest-resistant potato varieties from the famous 'Katahdin' potato of the 1930's to a new superior baking potato bred to grow in the Northeast—'BelRus'.

- Invented and developed the "bug bomb" (precursor of the aerosol can), saving thousands of lives from malaria and other tropical diseases during World War II and its aftermath.

- Developed the Beltsville small white turkey.

- Contributed to the "Green Revolution" (a turning point in agriculture that drastically reduced world hunger) by identifying and supplying disease resistant wheat to plant breeding centers around the world.

- Originated high-quality, large-fruited blueberry varieties from the wild that started the new and valuable cultivated blueberry industry.

- Developed detergent chemical methods for determining the nutritional value of feedstuff—now widely used throughout the world in both human and animal nutrition.

- Revolutionized the study of feed efficiency in dairy cattle by adapting automated equipment to energy metabolism research to determine the exact amount and kind of feed required for optimum milk production.

- Discovered and synthesized the chemicals that a variety of major insect pests emit to attract their mates—now being used for mass trapping and to survey insect populations for integrated pest management programs.

Recent

- Discovered plant viroids—a new class of disease-causing particles 80 times smaller than viruses—a discovery that may have broad significance concerning human health.
- Developed a fast, accurate test which allows veterinarians to detect anaplasmosis—a costly parasitic disease—in cattle.
- Discovered that a group of protozoan parasites (*Sarcocystis* species), long thought to be harmless cysts in the muscles of cattle, sheep, and swine, actually can cause weight loss and even death and produce abortion in pregnant animals.
- Developed the technology to freeze and thaw swine and poultry sperm—now used worldwide in artificial insemination programs.
- Developed computerized statistical analyses that give far more accurate genetic evaluations of dairy cattle and improved the system for scoring type traits (size of udder, body, legs) that are used in these analyses—now adopted for most U.S. breeds.
- Discovered nonhazardous feeding deterrents from natural sources such as the neem and tung trees which prevent at least 15 species of insect pests (including the Japanese beetle and the boll weevil) from feeding on crops.
- Developed the first alfalfa cultivars resistant to the disease anthracnose ('Arc') and tolerant to the alfalfa weevil ('Team').
- Discovered the first plant growth accelerator with the chemical structure of a steroid and synthesized several closely related compounds that also speed plant growth.
- Designed and built a number of instruments that use light or sound waves to quickly and accurately measure the composition, ripeness, or texture of meat, grains, vegetables, or fruits—now commercially manufactured for testing the quality of farm products.
- Developed a process for curing tobacco leaves at different stages of ripeness which reduces the toxic and carcinogenic constituents in smoke up to 70 percent and can save up to 50 percent hand labor for the farmer.

Agricultural Environmental Quality Institute

J. L. Hilton, Chairman
Room 233, Bldg. 001
Phone: (301) 344-3030

Sewage sludge mixed with wood chips as a bulking material is composted for use as a soil conditioner, fertilizer, or mulch on a 15-acre test site at Beltsville.

The Institute is searching for ways to increase food and fiber production to meet the needs of a rapidly expanding world population. Emphasis is placed on developing practices that avoid or minimize hazards to the environment.

The Institute is comprised of 9 laboratories and 1 unit.

Chemicals Coordination Unit
E. M. Osborne, Unit Head
Room 334, Bldg. 001
Phone: (301) 344-2137

Personnel collect data on more than 30,000 insect-control chemicals, searching for compounds that can zero in on specific insect pests with the least hazard to the farm worker or to his environment.

Analytical Chemistry Lab
K. R. Hill, Chief
Room 114, Bldg. 306
Phone: (301) 344-2495

Chemists develop new or improved analytical techniques for detecting and analyzing pesticide chemicals in air, soil, water, and agricultural products and collect data on the distribution and breakdown products of these pesticides.

Biologically Active Natural Products Lab
M. Jacobson, Chief
Room 323, Bldg. 306
Phone: (301) 344-2025

Researchers isolate, identify, and finally synthesize naturally occurring compounds from plant and animal sources which can be used in the war against harmful insects in lieu of conventional pesticides.

Biological Waste Management and Organic Resources Lab
J. F. Parr, Jr., Chief
Room 124, Bldg. 007
Phone: (301) 344-3163

A multidisciplinary team of scientists develop principles and practices that will ensure the economical, beneficial, and safe use of agricultural, municipal, and industrial organic wastes on land for soil improvement and plant growth. The Beltsville Aerated Pile Method of composting sewage sludge is one result of this laboratory's program.

Insect Reproduction Lab
A. B. Borkovec, Chief
Room 109, Bldg. 306
Phone: (301) 344-2136

Scientists examine the physiological and biochemical processes involved in insect reproduction and maturation to find methods or chemicals which will interfere with these processes.

Wooden pyramids painted white and covered with a sticky substance successfully trap face flies—the pesky insects that spread pinkeye among cattle.

Scientists at Beltsville have built five model "agroecosystems" to simulate field conditions for measuring pesticide residues in soil, plants, water, and air simultaneously.

Livestock Insects Lab
D. K. Hayes, Chief
Room 110, Bldg. 307
Phone: (301) 344-2474

To control arthropod pests of livestock, scientists investigate feed additives, fumigants, antifeedants, toxicants, and juvenoids. Basic studies on diapause (dormancy) delve into insect metabolism while applied research improves controlled release formulations and aircraft disinsection (destruction of insect hitchhikers after overseas flights).

Organic Chemical Synthesis Lab
J. R. Plimmer, Chief
Room 326, Bldg. 007
Phone: (301) 344-3645

Researchers seek to bypass the use of conventional insecticides by identifying and synthesizing organic compounds useful as insect control agents such as pheromones, attractants, repellents, egg-laying stimulants, and juvenile hormone mimics.

Pesticide Degradation Lab
P. C. Kearney, Chief
Room 100, Bldg. 050
Phone: (301) 344-3076

The staff examines the fate of pesticides in soils, plants, aquatic, and animal systems and cooperates with other agencies to establish effective criteria for assessing pesticides in the environment.

Soil Nitrogen and Environmental Chemistry Lab
A. W. Taylor, Chief
Room 228, Bldg. 007
Phone: (301) 344-3511

Fundamental research is done on the nitrogen cycle in soils, including nitrogen fixation and impacts of soil moisture and tillage practices. Scientists also study environmental chemistry of plant nutrients, herbicides, and insect pheromones and develop practices to improve agronomic efficiency and reduce adverse environmental impacts.

Weed Science Lab
D. L. Klingman, Chief
Room 231, Bldg. 001
Phone: (301) 344-3873

Scientists work to improve the safety and efficiency of weed control technology through basic and applied studies of herbicide activity in plants and through regulation of weed seed germination and dormancy. Narcotic plant control is also studies here.

Weed control research includes forcing dormant weed seeds to germinate at one time. A solution of ethanol stimulated these fall panicum seeds to sprout in unison and in complete darkness.

Animal Parasitology Institute

H. Herlich, Chairman
Room 100, Bldg. 1040
Phone: (301) 344-2201

Chickens that have been infected with coccidiosis are inspected regularly in a program to study development of natural immunity against the disease organisms.

The prime objective of this national center is to develop ways to prevent, control, or eradicate parasitic infections in livestock and poultry.

The Institute's 4 laboratories and 1 unit occupy 400 acres physically separated and secured from the other research areas to prevent parasitic contamination.

Parasite Classification and Distribution Unit
J. R. Lichtenfels, Head
Bldg. 1180
Phone: (301) 344-2444

Personnel carry out taxonomic research and maintain the National Parasite Collection—one of the world's largest collections of animal parasites—and the Index Catalog of Medical and Veterinary Zoology, an index of the world's literature on parasitology.

Hemoparasitic Diseases Lab
K. L. Kuttler, Chief
Bldg. 1072
Phone: (301) 344-2193

Basic biological research on parasites which cause anaplasmosis in cattle and sheep and babesiosis in cattle and horses is directed toward better diagnosis, treatment, and control of these diseases.

Blood is drawn from a calf that was infected with anaplasmosis. By testing the blood for the presence of parasites and antibodies against these parasites, scientists study the course of the infection or check the efficacy of experimental drugs.

Nonruminant Parasitic Diseases Lab
K. D. Murrell, Chief
Room 204, Bldg. 1040
Phone: (301) 344-2406

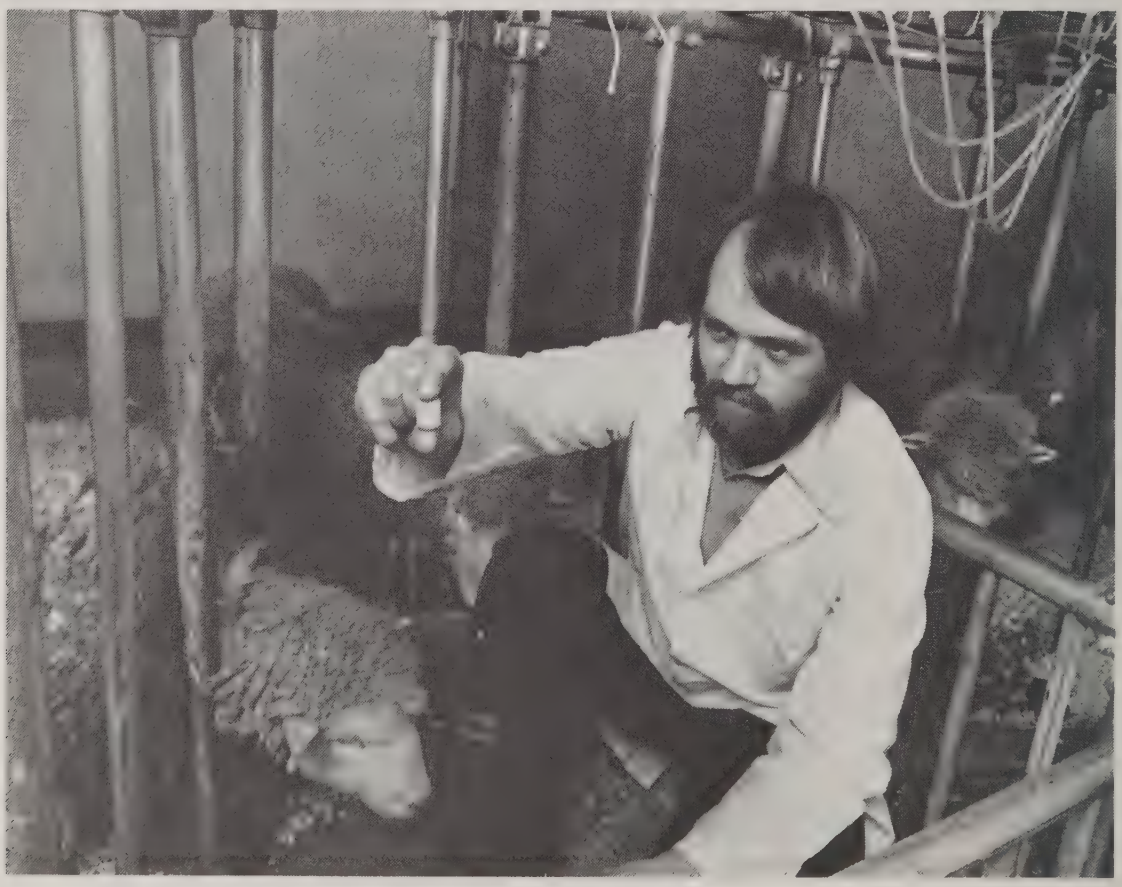
Controlling parasitic diseases which affect swine and other nonruminant animals is this laboratory's mission. Scientists study the basic biological interactions between host and parasite—basic information needed to develop control procedures, especially vaccines and immunodiagnostic reagents.

Poultry Parasitic Diseases Lab
M. D. Ruff, Chief
Room 208, Bldg. 1040
Phone: (301) 344-2300

Scientists study all aspects of poultry parasitic diseases, especially coccidiosis of chickens and turkeys, to obtain a better understanding of host-parasite systems leading to ultimate control of these diseases by biological methods, including vaccination.

Ruminant Parasitic Diseases Lab
R. Fayer, Chief
Bldg. 1045
Phone: (301) 344-2509

Basic biological research on parasites causing sarcocystosis, coccidiosis, and helminthiasis in cattle, sheep, and goats is aimed at developing biological and chemical control of these diseases.



To better control worms in sheep, scientists test experimental drugs and new ways of administering them. This large pill stays in the sheep's rumen and slowly releases a drug that prevents infection over an extended period.

Animal Science Institute

L. W. Smith, Chairman
Room 217, Bldg. 200
Phone: (301) 344-3431

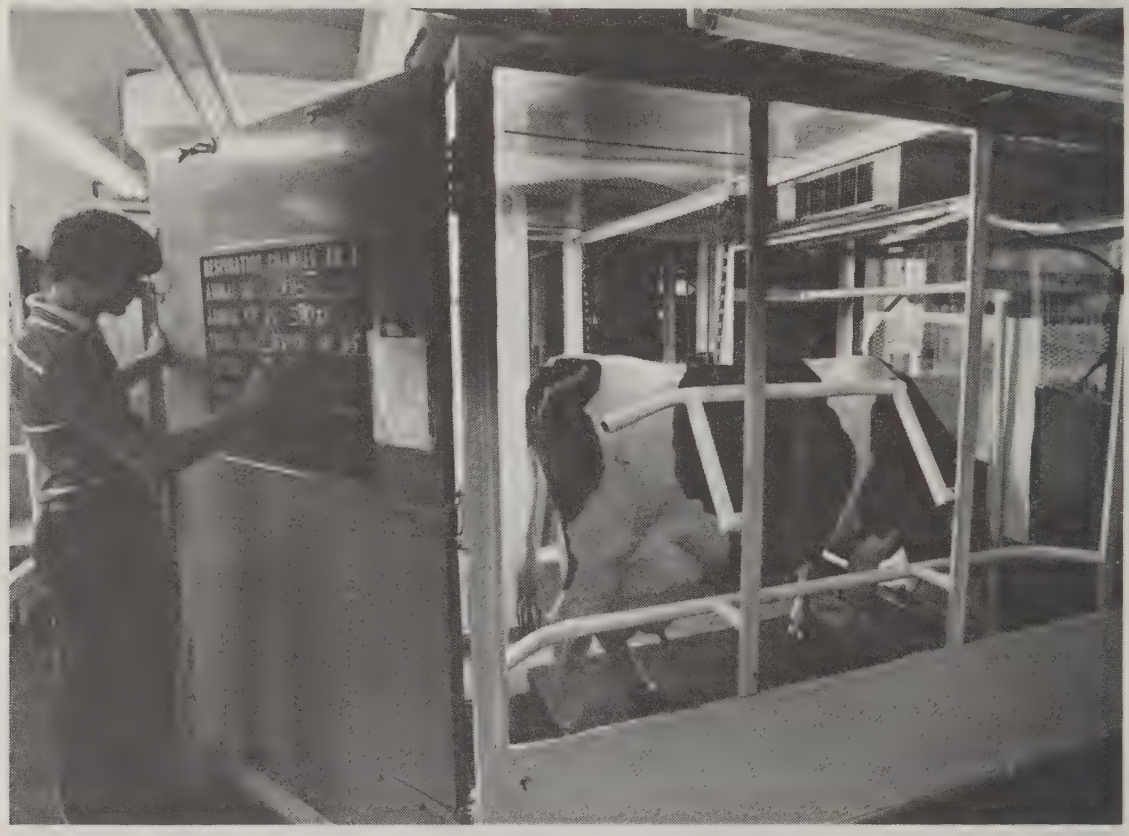
A plastic loop is inserted into the teat of a dairy cow. The loop causes mild irritation which increases the number of white blood cells ready to destroy bacteria which cause mastitis infection.

Institute scientists conduct a wide variety of research projects to increase livestock production efficiency and to improve the quality of animal products. While emphasis is on basic research, applied testing is also done to solve production problems in dairy and beef cattle, sheep, swine, turkeys, and other farm animals.

The Institute is divided into 7 laboratories.

Animal Improvement Programs Lab
F. N. Dickinson, Chief
Room 10A, Bldg. 263
Phone: (301) 344-2271

Scientists investigate advanced methods for genetic improvement of economically important traits in dairy cattle and implement advanced procedures to produce nationwide genetic evaluations and other research information in support of the National Cooperative Dairy Herd Improvement Program.



Inside this plexiglass chamber, scientists determine what happens to the food this cow eats—how much is used for milk, meat, and heat production and how much is excreted. This information is important in determining the energy value of feedstuffs.

Avian Physiology Lab
T. J. Sexton, Chief
Bldg. 262
Phone: (301) 344-2545

Scientists investigate the physiological and endocrinal factors that control reproduction in poultry (primarily turkeys), develop methods for storing semen, and design farm management systems which will maximize egg and semen production.

Meat Science Research Lab
A. W. Kotula, Chief
Room 105, Bldg. 201
Phone: (301) 344-2400

The safety of meat and meat products, particularly in the areas of microbial and harmful chemical contamination, are of prime consideration. Scientists also develop data bases for meat grading and quality, determine the nutrient quality and content of meat, and develop methods for modifying nutrient quality and content.

Milk Secretion and Mastitis Lab
R. H. Miller, Chief
Room 102, Bldg. 173
Phone: (301) 344-2330

Researchers study all aspects of the lactation process in milk cows to increase and sustain higher milk yield and to lower the frequency and severity of mastitis infection. Improved milking technology is developed here.

Nonruminant Animal Nutrition Lab
L. T. Frobish, Chief
Room 201A, Bldg. 200
Phone: (301) 344-2222

Scientists work to improve the efficiency of nonruminant livestock production by developing basic information on the nutritional and genetic factors which affect growth, production, and reproduction and by determining the nutritional, genetic, physiological, and microbiological interactions.

Beef carcasses that receive an electrical shock after slaughter can be processed immediately bypassing the initial cooling stage. This hot-boning method yields more tender beef cuts and reduces processing costs.

Reproduction Lab
H. W. Hawk, Chief
Room 6, Bldg. 200
Phone: (301) 344-2836

Scientists work toward better reproduction in farm animals by several methods—regulating estrus and ovulation with natural and synthetic compounds, improving egg fertilization, reducing embryonic deaths, and developing methods for preservation of boar semen.

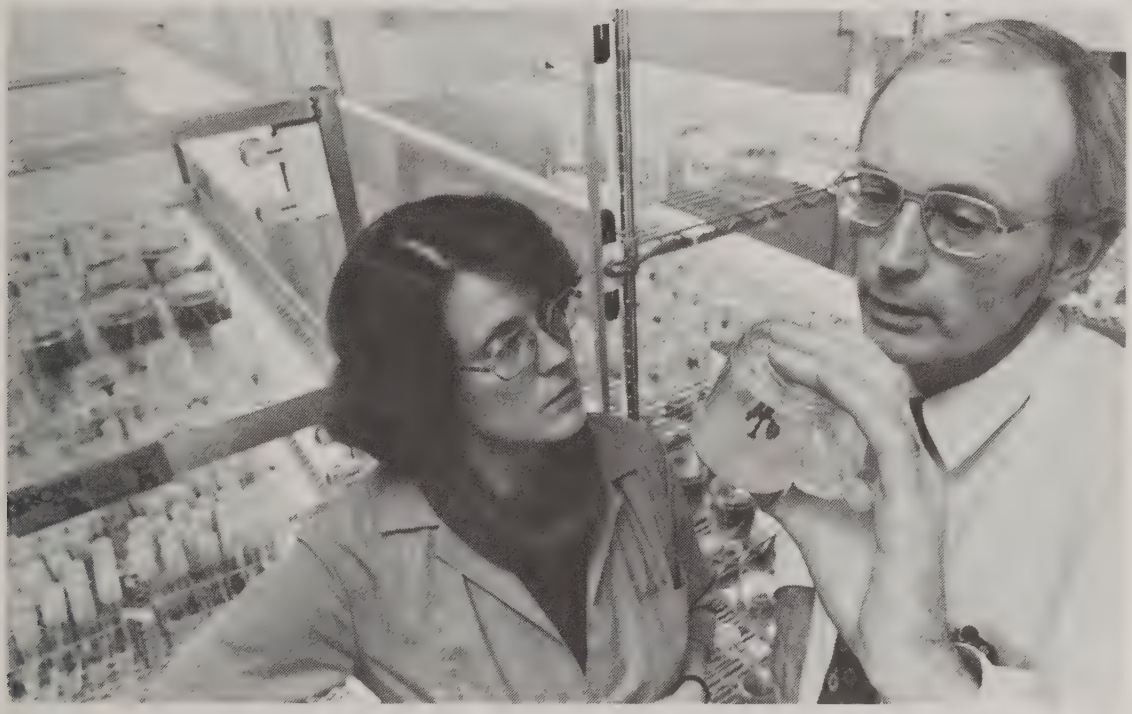
Ruminant Nutrition Lab
P. W. Moe, Chief
Room 124, Bldg. 200
Phone: (301) 344-2267

Nutrition studies are aimed at improving the efficiency of beef and dairy cattle and sheep in converting feeds into meat, milk, and wool. Major emphasis is on making ruminants less competitive with man and other animals for available feed supplies.

These cattle are part of a study to determine why some cattle develop a stress condition while grazing tall fescue. Cattle affected with this "summer syndrome" cease to graze for extended periods of time causing a loss in production.

Horticultural Science Institute

A. A. Piringer, Chairman
Room 130, Bldg. 003
Phone: (301) 344-3338



Researchers check a blackberry culture for new shoots. Some 20 to 40 new shoots from this single shoot can be divided and subcultured conceivably leading to over two million potential blackberry plants in about six months.

The Institute seeks optimum ways to originate, grow, protect, harvest, store, and deliver superior fruit, vegetable, and ornamental plants and products to consumers at minimum cost. Engineers and scientists cooperate to develop desirable new pest-resistant cultivars and new efficient production and postharvest handling practices that decrease energy use and assure the safety and health of workers and users. Studies on the fundamental biology of horticultural crops and their pests lead to these improvements and new techniques.

Research is divided among 6 laboratories and 1 center.

European Marketing Research Center
F. J. Marousky, Research Leader
Marconistraat 38B
Rotterdam, The Netherlands

Personnel conduct research on handling, packaging and transportation that will contribute to more efficient marketing of U.S. agricultural products in Europe. They evaluate arrival conditions of American test shipments and provide technical advice to European importers on receiving, handling, and storing U.S. agricultural products.

Florist and Nursery Crops Lab
H. M. Cathey, Chief
Room 101, Bldg. 004
Phone: (301) 344-3570

Scientists develop modern lighting systems as well as energy-efficient cultural practices to boost the productivity of greenhouse growers, nurserymen, and small farms. They originate improved lines of florist and nursery crops and develop improved methods for virus detection and disease diagnosis. Pest control practices developed from the study of insect behavior and ecology help to reduce pollution.

Under high pressure sodium vapor lighting, these geraniums flowered in half the time it will take for the geranium (hand held) grown under natural greenhouse conditions.

A scientist studies the differences in flower color chemicals which can be used to "fingerprint" cultivated varieties. Research led to the discovery of a natural pigment in morning-glories that can be used to replace banned red dyes #2 and 4 in food.

Fruit Lab
M. Faust, Chief
Room 119, Bldg. 004
Phone: (301) 344-3567

New varieties of strawberries, blackberries, blueberries, and grapes bred here combine disease resistance with superior characteristics. Scientists study fruit diseases searching for biological controls and evaluate nutrients in improving fruit quality and chemicals in regulating growth.

Horticultural Crops Quality Lab
R. E. Hardenburg, Chief
Room 112, Bldg. 002
Phone: (301) 344-3128

Researchers work to identify, measure, and protect desirable qualities in fruits, vegetables, and flowers from harvest to consumer use. Improved methods of controlling postharvest diseases and for storing or handling perishable products to reduce deterioration are developed.

Instrumentation Research Lab
K. H. Norris, Chief
Room 103, Bldg. 002
Phone: (301) 344-3650

Personnel develop instruments and techniques to measure the chemical and physical properties of a wide range of agricultural products. Emphasis is on using transmitted and reflected light to determine composition while sonic resonance is used to evaluate texture.

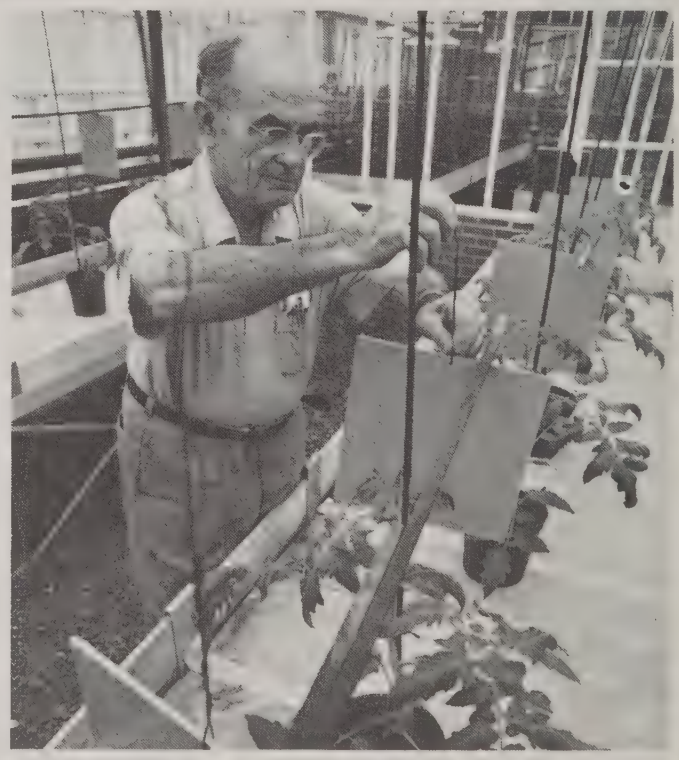
Postharvest Physiology Lab
M. Lieberman, Chief
Room 205, Bldg. 002
Phone: (301) 344-3014

Scientists study the basic physiological, biochemical, and ultrastructural changes associated with the aging process of flowers, fruits, vegetables, and seeds after harvest—information leading to improved methods for preserving perishable products.

Vegetable Lab
R. E. Webb, Chief
Room 220, Bldg. 004
Phone: (301) 344-3380

Scientists carry out breeding programs and related research on the major vegetable crops to develop resistance to disease and insects, increase yields, adapt vegetables to various farming conditions, and improve their nutritional, marketing, and processing qualities. Integrated pest control using biological means including host resistance, crop management, and chemicals is an important aspect of the work.

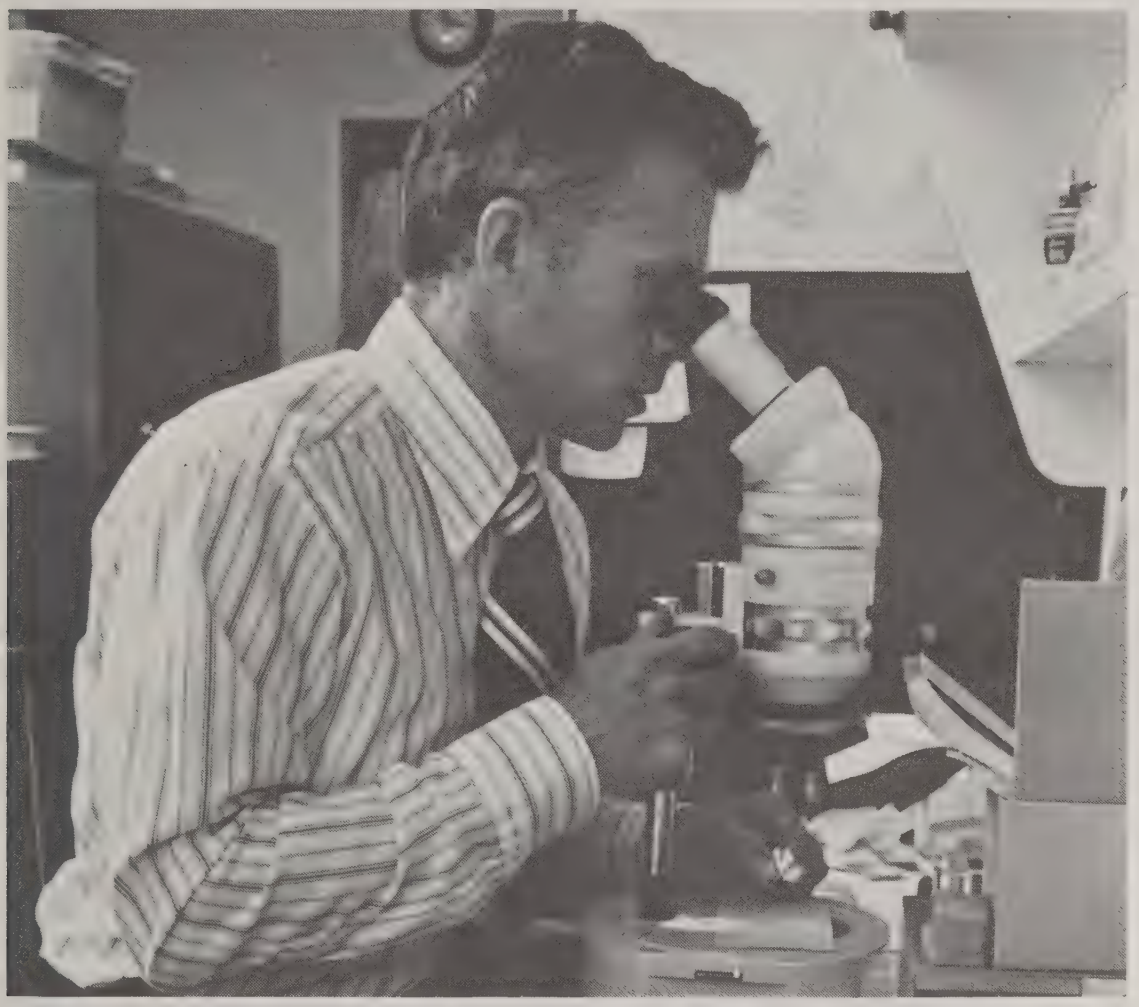
Pollen from a fire blight resistant pear tree is transferred to blossoms on a susceptible tree.



To control whitefly populations in greenhouses, a researcher hangs sticky yellow boards at the insects' eyelevel. The boards attract and trap adult whiteflies.

Insect Identification and Beneficial Insect Introduction Institute

L. Knutson, Chairman
Room 1, Bldg. 003
Phone: (301) 344-3182



A scientist examines one of the nearly 350,000 insect and mite specimens sent each year to the Systematic Entomology Laboratory for identification.

The Institute is devoted mainly to developing new and improved classification and principles for insect and mite identification and to discovering and studying foreign insect species that show promise for use in biological control of domestic insect pests and weeds.

Although about 1 million species of insects and mites have been scientifically described, this may represent only one-tenth of the world's species. The Institute's continuing program on insect and mite classification provides basic support for a wide range of research in agriculture and related sciences. This taxonomic information is essential for the effective conduct of many programs, such as pest control, integrated pest management, and quarantine.

The staff is divided between 2 laboratories with headquarters at Beltsville. Scientists are also stationed at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Beneficial Insect Introduction Lab
J. R. Coulson, Chief
Room 6, Bldg. 417
Phone: (301) 344-3185

Research is conducted on the use of natural enemies in controlling pest insects and weeds. An extensive documentation system is maintained to help coordinate U.S. and overseas research on importation, colonization, and evaluation of beneficial foreign insects and mites. Scientists also study the biosystematics of promising natural enemies (both introduced and native). Increasing effective crop pollination by wild bees is another research area.

Systematic Entomology Lab
P. M. Marsh, Chief
Room 4, Bldg. 003
Phone: (301) 344-3183

Scientists develop systems to classify insects and mites and furnish taxonomic services to public and private organizations and individuals. These scientists provide hundreds of thousands of insect and mite identifications annually, relying on their research, an outstanding library, and the Smithsonian Institution's National Collection of insect specimens—the world's largest.

Imported from Japan as an excellent pollinator, a female Osmia bee makes her home in a simple straw, pollinates in cooler weather, and is less susceptible to diseases and predators than honey bees.

Plant Genetics and Germplasm Institute

J. G. Moseman, Chairman
Room 127, Bldg. 001
Phone: (301) 344-3235

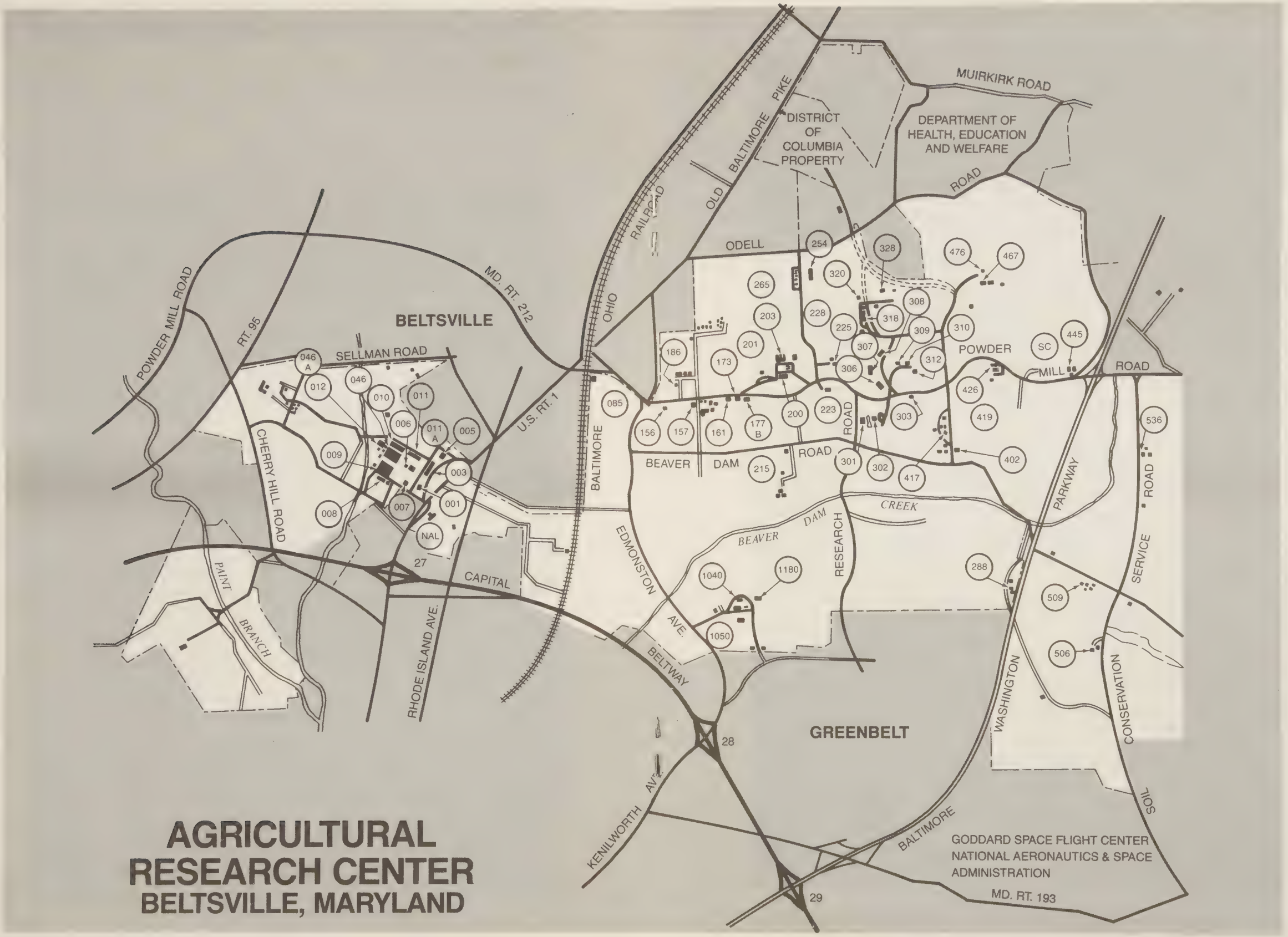
Cooperating on a project aimed at predicting crop yield by satellite, Beltsville and NASA scientists measure wave reflectance from bare ground and crop canopies to search for specific wave patterns that indicate stress conditions to crops.

The Institute is responsible for collection, conservation, and improvement of plants and seeds by genetic and cultural methods. Scientists travel worldwide to collect plants and seed which are conserved and distributed as germplasm throughout the world. The germplasm is used in research to understand and improve the quality and productivity of many crops.

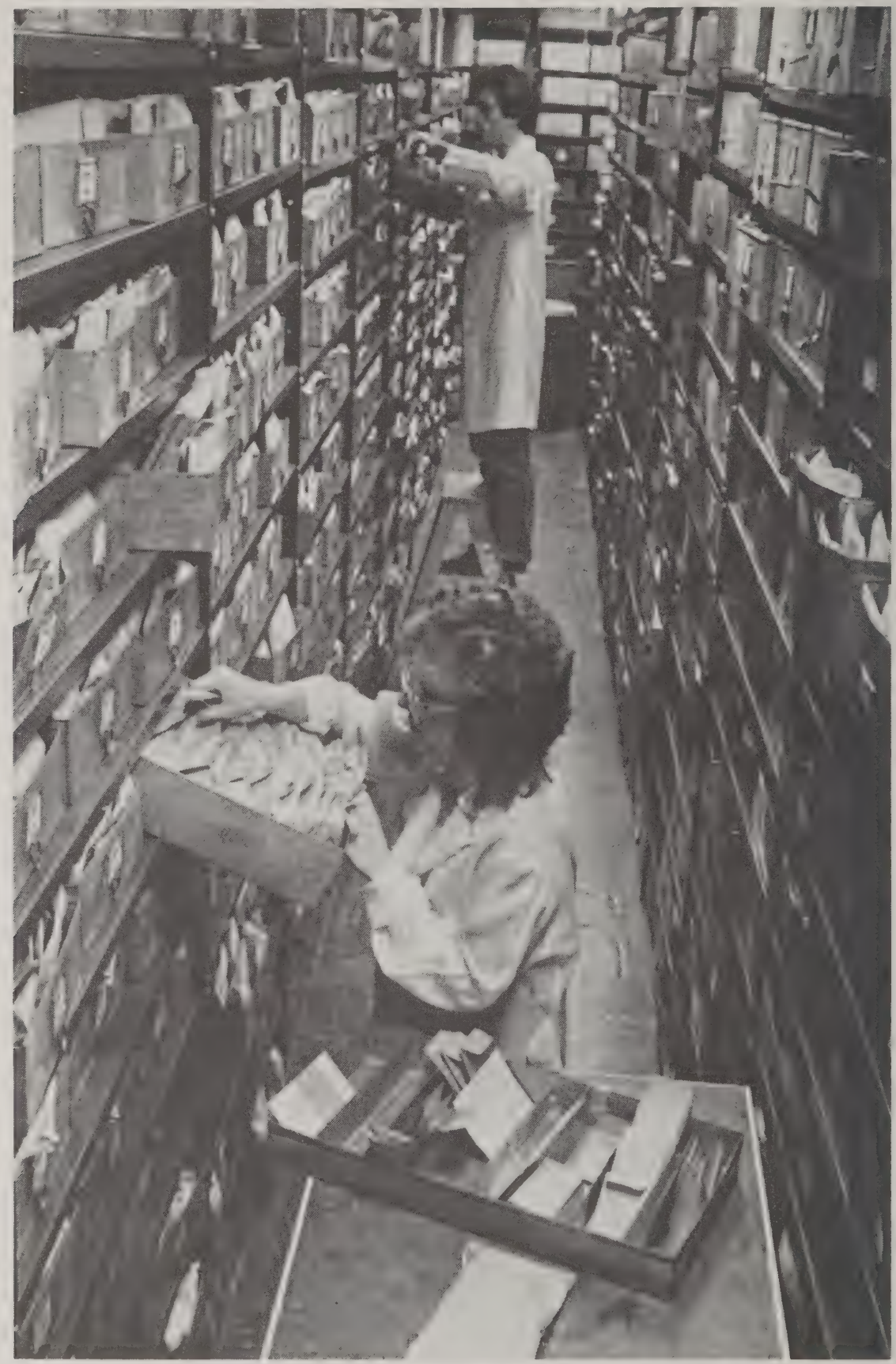
The Institute is comprised of 6 laboratories.

Economic Botany Lab
J. A. Duke, Chief
Room 21B, Bldg. 265
Phone: (301) 344-2432

The staff obtains plant material for chemical and biological screening to identify useful new products, especially for cancer treatment. A data bank on distribution, ecological attributes, and nutritional values of economic plants and weeds is maintained here.



AGRICULTURAL RESEARCH CENTER
BELTSVILLE, MARYLAND



The world's largest working collection of wheat, oat, barley, and rye seeds is housed at Beltsville. It serves as a gene reservoir for breeders and plant scientists around the world.

Field Crops Lab
J. B. Powell, Chief
Room 329, Bldg. 001
Phone: (301) 344-3643

Basic research in genetics, breeding, pathology, entomology, remote sensing, and agronomy allows scientists to develop better cultural practices and better varieties of crop plants—alfalfa, soybeans, forage grasses, turfgrasses, barley, wheat, corn, oats, rice, sugarbeets, and other crops.

Germplasm Resources Lab
H. E. Waterworth, Chief
Room 326, Bldg. 001
Phone: (301) 344-3637

Personnel introduce, evaluate, distribute and exchange germplasm needed in research and guide scientists in locating sources of germplasm and crop collections. The staff maintains over 80,000 accessions of wheat, oats, barley, and rye, and 15,000 rice accessions plus limited quantities of other crops and acts as a focal point in exchange of germplasm from the U.S. throughout the world.

Plant Taxonomy Lab
R. E. Perdue, Jr., Chief
Room 126, Bldg. 001
Phone: (301) 344-2612

Scientists study plants of economic or potential economic value in the field, the herbarium, and the library, with emphasis on grasses and legumes. Personnel identify agricultural plants and maintain one of the world's largest seed collections as well as a nomenclature file.

Seed Research Lab
A. A. Abdul-Baki, Chief
Room 103, Bldg. 006
Phone: (301) 344-3566

Improved technology for producing, storing, and marketing high quality seeds is developed from an understanding of physiological and biochemical factors that comprise seed quality. The laboratory is one of two U.S. stations accredited by the International Seed Testing Association.

Tobacco Lab
T. C. Tso, Chief
Room 115, Bldg. 001
Phone: (301) 344-3478

Variables of tobacco plants from their genetic makeup through conditions during growth and post-harvest treatment are studies to improve tobacco safety and usability. Scientists identify chemical and physical properties of the leaf which contribute to harzardous smoke agents.

Plant Physiology Institute

M. N. Christiansen
Room 221, Bldg. 001
Phone: (301) 344-3036

A scientist checks the peanut yield in tests designed to evaluate various strains of nitrogen-fixing bacteria from around the world. Pale plants in background are the result of inefficient bacteria.

The mission of this Institute is to develop basic information on plant function and reaction to environment which will provide a foundation for cultural and genetic improvement of crop yield and quality.

Soil, air, light, water, temperature, and related environmental conditions as well as hormones affecting plant growth are studied in 7 laboratories.

Agricultural Equipment Lab
L. E. Campbell, Chief
Bldg. 303
Phone: (301) 344-2237

Engineering specialists study systems and develop equipment for crop production in field, nursery, greenhouses, and indoors emphasizing energy efficient and cost effective techniques. Research includes effects of light radiation, small farm equipment needs, and crop protection from insects.

Cell Culture and Nitrogen Fixation Lab
G. W. Schaeffer, Chief
Room 309A Bldg. 001
Phone: (301) 344-2103

Researchers develop techniques to modify the genes of plant cells and reconstruct an improved plant from a single cell or a group of cells. Special emphasis is on soybean improvement—higher yields, disease and insect resistance, and more efficient nitrogen fixation.

A soybean leaf is inserted into a device which measures its carbon dioxide uptake. Photosynthesis studies are carried out in growth chambers where temperature, humidity, and light intensity can be controlled.

Laboratory technicians inoculate soybean seeds with a select strain of the nitrogen-fixing bacteria to test for improved nodulation.

Hydrology Lab
E. T. Engman, Chief
Room 139, Bldg. 007
Phone: (301) 344-3490

Scientists test methodologies such as mathematical modeling and remote sensing to predict runoff and water yield. They study all phases of water movement and storage to provide a complete picture of watershed hydrology, then build on the results of smaller studies to describe broader geographical areas.

Light and Plant Growth Lab
N. J. Chatterton, Chief
Bldg. 046A
Phone: (301) 344-3295

Plants are grown in controlled and natural environments to study the processes influenced by major environmental factors, such as light, which interact with cellular constituents and plant growth during photosynthesis and photomorphogenesis. This information is used to identify cultivars and environment that maximize the annual economic yield.

Plant Hormone and Regulators Lab
G. L. Steffens, Chief
Greenhouse 4, Bldg. 050
Phone: (301) 344-3061

Scientists discover and evaluate natural and synthetic plant regulators—compounds that control plant growth and development processes. Research involves discovering, identifying, synthesizing, and evaluating regulators and understanding hormonal control mechanisms in order to increase crop production efficiency.

Plant Stress Lab
C. D. Foy, Acting Chief
Room 206, Bldg. 001
Phone: (301) 344-3143

Researchers subject plants to pollutants and toxic materials, extremes in temperature, and deficiencies in water, oxygen, or nutrients to determine their limits. Chemical, cultural and genetic methods of increasing plant tolerance to adversity are studied.

Water Data Lab
J. B. Burford, Chief
Room 236, Bldg. 007
Phone: (301) 344-3550

Hydrology research data from over 200 watersheds around the country are catalogued, evaluated, and stored in a computerized system developed by lab personnel, who also prepare annual reports and answer requests for hydrologic information.

Plant Protection Institute

B. Y. Endo, Chairman
Room 165B, Bldg. 011A
Phone: (301) 344-3848

A tobacco hornworm (front) fed a chemical that disrupts the molting process is many times smaller than its normal "cousin" (rear) and will never mature to the adult stage.

Imported sugarcane plants are checked for diseases and insects in this quarantine facility before being shipped to plant breeders and researchers.

Institute research is aimed at controlling pests and diseases of plants and bees. Fundamental and practical studies encompass the insects, nematodes, and microorganisms that cause losses to crop production and the environmental factors that affect pollination of crops and production of honey and beeswax.

The Institute's 8 laboratories specialize in various aspects of plant protection.

Applied Plant Pathology Lab
A. G. Gillaspie, Jr., Chief
Room 201, Bldg. 004
Phone: (301) 344-3600

The causes and effects of diseases in soybeans (in relation to nitrogen fixation), other oilseed crops, snapbeans, and lima beans are studied to enable scientists to manage disease control by breeding for disease resistance and by other means. Personnel also operate the National Sugarcane Quarantine facility where they study plant diseases in relation to quarantine problems.

Bioenvironmental Bee Lab
H. Shimanuki, Chief
Room 211, Bldg. 476
Phone: (301) 344-2205

Scientists study the best means of controlling diseases and pests of the honey bee and provide a diagnostic service for beekeepers. Research includes finding the prime nutrients that help keep honey bees healthy and designing computer simulations of honey bee populations.

Insect Pathology Lab
J. L. Vaughn, Chief
Room 214, Bldg. 011A
Phone: (301) 344-3689

Microorganisms—bacteria, protozoa, viruses, and mycoplasma—which cause diseases in insect pests are identified and thoroughly studied. Scientists then conduct preliminary experiments on the production, formulation, and safety of promising microbial agents for insect control.

Insect Physiology Lab
J. A. Svoboda, Chief
Room 106, Bldg. 467
Phone: (301) 344-2389

Scientists search for, isolate, identify, and synthesize chemicals from insects, plants, and other natural sources which control or disrupt the normal hormone regulated processes in insects. These natural and synthetic chemicals are tested for potential use in controlling insects and other pests, parasites, and pathogens of agricultural importance.

Mycology Lab
P. L. Lentz, Chief
Room 313, Bldg. 011A
Phone: (301) 344-3364

The staff makes information available from data collections on practically everything known about fungi—including mushrooms, yeasts, and molds —that are beneficial or harmful to plants, animals, and man. The world's largest collection of preserved fungus specimens is housed here. Basic studies are conducted on selected species of fungi that affect agriculture and man.

Nematology Lab
R. V. Rebois, Chief
Room 165A, Bldg. 011A
Phone: (301) 344-3660

Basic and applied research is directed to the study and control of plant and insect parasitic nematodes. Taxonomic and host-parasite research provide basic concepts for the control programs that involve both chemical and biological systems that are ecologically sound. Nematode control is essential to integrated pest management programs.

Plant Viology Lab
R. L. Steere, Chief
Room 252, Bldg. 011A
Phone: (301) 344-3684

Research on plant viruses and diseases formerly thought to be caused by viruses has led to the discovery of spiroplasmas and small satellite viruses which reproduce only in plants infected by other viruses. Scientists study these pathogens and the diseases they cause and develop new techniques of preparing materials for study under the electron microscope.

Soilborne Diseases Lab
G. C. Papavizas, Chief
Room 274, Bldg. 011A
Phone: (301) 344-3682

Researchers develop and combine several methods—biological, cultural, chemical, and genetic—to control plant diseases caused by soilborne pathogens. To this end they study the environmental factors affecting pathogen survival and interactions among these pathogens and other microorganisms in the soil.

Stock cultures of insect organs are used to study the biology of microorganisms that are harmful to insect pests and to develop methods for mass producing these microorganisms for insect control.

Beltsville Human Nutrition Research Center

W. Mertz, Chairman
Room 223, Bldg. 208
Phone: (301) 344-2157

Diets that have been modified in fat content are ready for human volunteers who are participating in a study of the effects of fat content on blood pressure and blood lipids.

The Center, which is under the aegis of SEA's Human Nutrition, is concerned with determining human requirements for energy, protein, carbohydrates, lipids, vitamins, and minerals. It is also concerned with understanding the many interactions of these individual nutrients and their consequences for health.

Part of the research deals directly with human subjects fed experimental diets under controlled conditions. Other tests are done with small laboratory animals. From these tests, scientists establish the amount and kinds of food components needed in the diet for growth and optimal performance. New knowledge about animal and human requirements for micronutrients not known to be essential in the past, such as zinc, selenium, and chromium, is emerging from these studies. Scientists are working to define the metabolism of these elements, to determine the exact requirement by different age groups, and to assess the adequacy of the intake by various population groups.

Scientists investigate the nutritional qualities of foods including composition, biological interactions, and the availability of macronutrients and micronutrients. One laboratory provides data on the nutrient composition of foods so that sound diets can be recommended. Another laboratory is specifically concerned with the nutritional value of dairy products particularly as they are influenced by processing. Popular fermented milks such as yogurt are studied to understand their nutritional quality and their effect on human health.

The five laboratories that comprise this Center are: Carbohydrate Nutrition Laboratory, Lipid Nutrition Laboratory, Protein Nutrition Laboratory, Vitamin and Mineral Nutrition Laboratory, and Nutrient Composition Laboratory.

Other Science and Education Administration (SEA) Activities at the Center

Northeastern Regional Office
S. C. King, Regional Administrator
Room 333, Bldg. 003
Phone: (301) 344-3418

The agricultural research program of SEA is divided into four geographic regions in order to be responsive to regional research needs. The administrator for the Northeastern Region has the major responsibility for implementing and operating the research program within this region, which includes the Beltsville Agricultural Research Center. The administrator maintains close liaison with action agencies, such as SEA Extension and the Soil Conservation Service, which use research information, and with the State Agricultural Experiment Stations to insure that State and Federal research programs are complementary.

Other Science and Education Activities at Center

Administrative Operations Division
T. J. Clark, Chief
Room 311, Bldg. 003
Phone: (301) 344-3646

The division provides administrative leadership, advice, and technical support services to SEA headquarters management units, the agricultural research units in the Northeastern Region, and the program units of Human Nutrition located within the geographic boundaries of the Northeastern Region. These functions include personnel management, financial management, administrative services, and contracting.

Communication and Data Services Division
L. J. Bracato, Chief
Room 013, NAL
Phone: (301) 344-3767

This staff is responsible for all data processing activities in SEA including approvals, installations, programming, systems analysis, and leasing of both software and hardware. The staff provides technical guidance for the consulting statisticians and for modeling and simulation.

National Program Staff
(Vacancy),
Deputy Administrator
Room 125, Bldg. 005
Phone: (301) 344-3084

The staff was established to assure that the agricultural research program remains nationally oriented even though personnel and financial resources are allocated on a regional basis. The staff serves as advisors to researchers and administrators in developing policy and program, and in making reviews and evaluations.

National Technical Editing Staff
I. Y. Ballew, Chief
Room 1402, NAL
Phone: (301) 344-3498

Divided into seven editorial units based on research subject matter, the staff has the responsibility of assuring that manuscripts are submitted to technical journals in the best form possible to enhance communication among scientists and to maintain the reputation of individual scientists and SEA. The staff also coordinates nationwide information exchange among scientists.

Program Analysis Staff
J. M. Brazzel, Chief
Room 27, Bldg. 005
Phone: (301) 344-2501

Staff members are responsible for identifying critical needs and opportunities in the food and agricultural sciences and for recommending current and long-range priorities for programs in agricultural research, extension, higher education, and technical information systems. Position papers are also prepared for consideration by the Joint Council on Food and Agricultural Sciences and the National Agricultural Research and Extension Users Advisory Board. Major emphasis is given to long-range planning.

Other Science and Education Activities at Center

Program Planning Staff
E. L. Corley, Chief
Room 106, Bldg. 005
Phone: (301) 344-3057

This staff aids in SEA-wide program planning, coordination, and budget development, helping to: develop program structures, develop or update national science and education programs as needed, integrate program planning with budget development, and integrate program with resources and management planning.

Radiological Safety Staff
R. D. Jarrett,
Radiological Safety Officer
Room 226, Bldg. 001
Phone: (301) 344-3054

The staff is responsible for the proper acquisition, safe use, and disposal of radioactive materials and/or equipment that emits potentially hazardous ionizing radiation.

Technical Information Systems
R. A. Farley, Deputy Director
Room 109A, NAL
Phone: (301) 344-4248

Housed in the 15-story National Agricultural Library building this new SEA unit has three components: The National Agricultural Library (NAL) with the world's largest collection of printed materials on agriculture and related sciences (1.6 million volumes), the Agricultural Libraries Information Network (ALIN) with its link to agricultural libraries and USDA scientists throughout the country, and Automated Agricultural Information Systems (AAIS) with computers and other modern techniques designed to provide instant information to researchers, technicians, and the general public. TIS is international in scope, embraces many languages, and covers all the sciences supporting agricultural research.

Other USDA Agencies at the Center

Agricultural Marketing Service
Animal and Plant Health Inspection Service
Food Safety and Quality Service
Forest Service
Soil Conservation Service

Other Federal Agencies at the Center

Environmental Protection Agency
Food and Drug Administration

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